through Lake Kamolondo Bartle Frere's great river, and that afterwards farther down it takes in Young's great stream through Lake Lincoln, I ventured to think that I was on the right track. Two great rivers arise somewhere on the western end of the watershed, and flow north—to Egypt (?). Two other large rivers rise in the same quarter and flow south, as the Zambesi, or Liambai, and the Kafue, into Inner Ethiopia. Yet I speak with diffidence, for I have no affinity with an untravelled would-be geographer who used to swear to the fancies he collected from slaves till he became blue in the face. I know about six hundred miles of the watershed pretty fairly. I turn to the seventh hundred miles with pleasure and hope. I want no companion now, though discovery means hard work. Some can make what they call theoretical discoveries by dreaming. I should like to offer a prize for an explanation of the correlation of the structure and economy of the watershed with the structure and economy of the great lacustrine rivers in the production of the phenomena of the Nile. The prize cannot be undervalued by competitors even who have only dreamed of what has given me very great trouble, though they may have hit on the division of labour in dreaming, and each discovered one or two hundred miles. In the actual discovery so far, I went two years and six months without once tasting tea, coffee, or sugar; and, except at Ujiji, have fed on buffaloes, rhinoceros, elephants, hippopotami, and cattle of that sort; and have come to believe that English roast beef and plum pudding must be the real genuine theobroma, the food of the gods, and I offer to all successful competitors a glorious feast of beefsteaks and stout. No competition will be allowed after I have published my own explanation, on pain of immediate execution without benefit of clergy! I send home my journal by Mr. Stanley, sealed, to my daughter Agnes. It is one of Letts' large folio diaries, and is full except a few (five) pages reserved for altitudes which I cannot at present copy. It contains a few private memoranda for my family alone, and I adopt this course in order to secure it from risk in my concluding trip."

NOTES

We are in a storm of Congresses. Scarcely has the British Archæological Institute finished its work at Southampton before the British Archæological Association, the Iron and Steel Institute, and the British Medical Association have thrown Wolverhampton, Glasgow, and Birmingham respectively into unwonted excitement; while by this time next week the British Association will be in full swing at Brighton. With regard to this latter Congress, we are happy to announce that admirable arrangements for the reception of visitors are being made, and that a large and satisfactory meeting, under the presidency of Dr. Carpenter, may be anticipated.

At the moment of going to press we hear that a M. Delaunay, "director of the Astronomical Observatory" (*sic*), has been drowned by the upsetting of a boat at Cherbourg. We sincerely trust this does not refer to the distinguished director of the Observatory of Paris. But the telegram is ominous.

The French Association for the Advancement of Science will hold its first annual meeting at Bordeaux, from the 5th to the 12th of September. The Administrative Council, consisting of MM. Claude Bernard, Broca, Delaunay, A. d'Eichthal, De Quatrefages, Wurtz, Cornu, secretary of the Association, Masson, treasurer, and Gariel, secretary of the Council, have issued a circular inviting many of our most eminent men of science to be present; and, as the new French society is based upon an old English one, it will be both graceful and useful that as many shall attend as possible. We have also received the first publication of the society, containing a *compte rendu* of the inauguration meeting of the society, held in April in Paris, and the statutes of the society, which have already appeared in Nature nearly in their final form. We wish the society every success; its object is essentially decentralisation. Would we in England were in a position to decentralise!

Dr. Cobbold, F.R.S., has been appointed to a Professorship of Helminthology at the Royal Veterinary College. During the ensuing winter months he will give a course of lectures on the Parasites and Parasitic Diseases of our domesticated animals.

Dr. Brown-Sequard has resigned the Chair of Comparative and Experimental Pathology in connection with the Faculty of Medicine in Paris, which he has occupied several years. M. Vulpian has applied for the Chair.

Dr. Gerhart, of Jena, has been appointed successor to Dr. Bamberger as Professor of Clinical Medicine at Würzburg.

We regret to learn that Mr. M. C. Webster, the acting collector at Trichinopoli, to whose exertions the Eclipse Expedition owed so much, has been ordered home without delay for two years on sick certificate.

One of the most recent applications of science to practical purposes, which, according to most people is the only part of science which is worth anything, is sufficiently curious. In the "Mors Electrique" of M. Sidot, we have electricity employed in a manner to combine the study of electricity with a ride or drive into the country in company with a restive horse. Nothing is more simple. In the carriage, or even in the saddle, we have a pile *système hermétique Trouvé*, and a small induction coil, along the reins the magic wires are laid, and on either side the animal's lower jaw we have a *couronne metallique*. These are the data. The inventor is under the impression that when the quadruped's motion becomes too rapid it will be instantly brought to zero by the passage of the spark through the aforesaid jaw, but we do not learn that he has tried it. We would suggest that in a cavalry charge it would be most effective. This should be tried at the forthcoming manœuvres. In war the principle might be extended. The horses might be armed unicorn-wise, with blunderbusses and Abel's fuzes, the *couronne metallique* being of course removed from the lower jaw to the novel weapon. Probably in this way the functions of the riders might be abolished altogether; this would bring about a great saving in the army estimates, and in this way cause the Government to think that there may be something in science after all.

No. 6 of the Illustrated Catalogue of the Museum of Comparative Zoology at Harvard College, just come to hand, contains the supplement to the Ophiuridæ and Astrophytidæ by Theodore Lyman, with two plates, in which figures are given of the most important of the singular deep-sea Ophiurans brought up by the dredgings off the coast of Florida, and described in Bulletin No. 10, vol. i. of the Catalogue.

Our common sparrow, as most of our readers are aware, has been for some time naturalised in the New York parks and elsewhere in the United States, for the purpose of keeping in check a plague of caterpillars, in which office it is doing yeoman service. We regret to learn by a paragraph in *The New York Industrial Monthly* that our compatriots are in danger of extermination by a race of feathered rowdies, also bent upon turning the balance of creation their own way. The sparrow's enemy is the great northern shrike; and the *Industrial Monthly* states that one of these "butcher-birds," which eat only the brains of their victims, recently killed a sparrow "by squeezing its head into a crotch made by the fork of two branches, each about half an inch thick."

The Paris Academy of Sciences has submitted the names of MM. Loewy and Wolf to the Minister of Public Instruction to fill the vacancy in the Bureau des Longitudes, occasioned by the death of M. Langier.

M. Folie has recently called the attention of the Royal Academy of Sciences of Belgium to the question of the density of the earth. He criticises some points in Sir George Airy's discussion of his observations, which gave the value 6·566, and states his opinion that 6·439 is nearer the mark.

In the *Canadian Journal* for July, Prof. H. Alleyne Nicholson discusses the Contemporaneity of Strata and the Doctrine of Geological Continuity with the view of demonstrating "that groups of strata presenting the same fossils, if widely removed from one another in point of distance, can only exceptionally be 'contemporaneous' in the strict sense of the term. On the contrary," he contends, "in so far as we can judge from the known facts of the present distribution of living beings, the recurrence of exactly the same fossils in beds far removed from one another, is *prima facie* evidence that the strata are *not* exactly contemporaneous; but that they succeed one another in point of time, though by no long interval, geologically speaking." Dr. Nicholson concludes "that it is not correct to say that we are living in the Cretaceous period in any other sense than one might say we are living in the Silurian period; with this difference only, that the Cretaceous period is much nearer to us in point of time than the Silurian, and that we can thus trace a relationship between certain living types and certain Cretaceous forms, such as we cannot hope to establish in the case of Silurian forms." Farther, "the conditions present in the deep Atlantic cannot be exactly similar to those of the Cretaceous seas; for the *Cephalopoda* of the chalk seem to have no representatives in the abyssal mud of the Atlantic, while this class was well represented in the Carboniferous times; so that there is, if anything, a closer genetic connection between the chalk and the Carboniferous limestone than between the chalk and the Atlantic 'ooze.'"

The principal articles in the Transactions of the Royal Microscopical Society for August are the conclusion of Dr. L. S. Beale's paper on the Nerves of Capillary Vessels and their probable action in Health and Disease, a discussion of the vexed question of the Nomenclature of Objectives, by Dr. J. J. Woodward, of the U. S. Army, and a useful paper, by Dr. R. H. Ward, on Our Present Medical and Students' Microscopes.

The July number of the Proceedings of the Geologists' Association contains a paper, by Mr. Henry Woodward, on Relics of the Carboniferous and other old Land Surfaces, and an essay, by Mr. M. Hawkins Johnson, towards a solution of the chalk-flint enigma.

There are only two papers in the recent issue of the Transactions of the Institution of Engineers and Shipbuilders in Scotland, one on the Manufacture of Cast Steel, by Mr. B. D. Healey, the other, by Mr. Alexander Morton, on the Expansion of Water. The former is copiously illustrated.

Other things besides history have a tendency to repeat themselves. Vice-Consul Green, in his report concerning the Tunisian fisheries, states that a large portion of the fish supply of the capital of that African state comes from the Bisuta Lake, a distance exceeding forty miles, on pack animals, and, consequently, frequently arrives in an unmarketable state. It is calculated that if proper and expeditious conveyance could be obtained, the supply of the fishery would be sufficient to augment its yearly value by 15,000*l.* or 20,000*l.* But owing to the present fish farmer being able, without any considerable outlay in guards and assistance from preservative enactments, to secure a handsome return from the fisheries conceded to him, great waste and destruction of fish exist.

The Proceedings of the Asiatic Society of Bengal for May consist mainly of the third instalment of Dr. F. Stoliczka's Notes on the Reptilian and Amphibian Fauna of Kachh or Cutch.

According to Dr. Henry Seueur, the twenty-eight weeks' siege of Paris cost upwards of 50,000 lives to the civil population. He ascertains that 300,000 Parisians left Paris by rail before the investment; but 190,000 regular troops and 170,000 refugees from the suburbs entered the city; so that the population of Paris, on the whole, was raised from 1,890,000 to about 2,000,000, the excess consisting chiefly of men between twenty and forty years of age. The mean mortality of the four preceding years and of the following year for these twenty-eight weeks was 24,928; that for the twenty-eight weeks of 1870-71 was 77,231—an excess of 52,303. The mortality fell unevenly on persons of various ages. Between fifteen and twenty-five, it was multiplied sixfold. The general mortality was tripled. The mortality was least among men from forty to sixty; they took no part in active service, and had comparatively greater facilities for resisting cold and privation. The diseases which contributed chiefly to the immense mortality were six—small-pox, bronchitis, pneumonia, typhoid fever, diarrhœa, and dysentery.

The seventh annual meeting of the Quekett Microscopical Club took place on the 26th ult., when Dr. L. S. Beale, F.R.S., the retiring president, delivered his valedictory address. The club now numbers about 550 members. Dr. R. Braithwaite, F.L.S., is the president for 1872-3. The four vice-presidents are Dr. L. S. Beale, F.R.S., Mr. Arthur E. Durham, Mr. Henry Lee, and Dr. Matthews. The following gentlemen have been re-elected to serve during the ensuing year:—As treasurer, Mr. Robert Hardwicke, F.L.S.; as secretary, Mr. T. Charters White; and as secretary for foreign correspondence, Mr. M. C Cooke, M.A.

The *British Medical Journal* thinks "it cannot be doubted that one moral will be finally drawn from the difficulties of the southern districts of London as to their water-supply. An adequate supply of drinking water to a crowded part of a great city is of as great importance as a supply of fresh air; and it may reasonably be doubted whether any pains or penalties will suffice to protect a great population from the shortcomings of companies who undertake to furnish a water-supply on purely commercial grounds, and who neither have nor can be expected to have any benevolent interest in the health and comfort of their customers. The water companies of the metropolis hold in their hands the lives of a very large mass of people; and very slight *lâches*, as in the case of the East London epidemic of cholera, suffice to slay hundreds of helpless and perfectly innocent water-drinkers." The *Journal* holds out to "the consideration of all classes of statesmen and of electors, whether the water-supply of great cities, such as London, should be left to the tender mercies of companies, whose opinion as to the importance of 'living organisms' and 'previous sewage contamination' are notoriously sceptical, and are much influenced by the annual arguments presented by the auditors." The Lambeth Water Company, it remarks, "is alike a terror to drunkards and teetotallers; it adds a fresh terror to adulteration, and another curse to the list of those that afflict great cities."

We have received Part iv. of the fourth edition of Yarrell's "British Birds," edited by Prof. Newton, and in course of publication by Van Voorst. The birds described in this part are chiefly of the families *Turdidæ* and *Silvidæ*.

At the recent half-yearly meeting of the Grand Trunk Railway Company of Canada, in respect to the rails being exposed to severe cold for a great length of time, the President said that from 3,500 to 4,000 rails on the line break every winter! But he found comfort in the fact that, in about 110 miles of steel track, only eight or ten rails have broken. This would seem to indicate that Bessemer rails are suitable for cold climates.

CAPTAIN MAJENDIE, in his report of the Stowmarket explosion, says that he resisted as long as possible the suggestion that the catastrophe was due to foul play on the part of some one who wilfully added acid to properly purified and manufactured gun-cotton. Step by step, however, his examination established the theory of foul play as the correct one; and in face of the evidence no other verdict than that given by the jury was possible. He thinks the balance of probability leads to the belief that whoever added the acid was unaware of the terrible consequences it would produce.

THE pupils of the Trade School at Keighley, in Yorkshire, established by the Schools Inquiry Commissioners for the higher education of the children of the artisan classes of that town, have distinguished themselves in the recent examinations. The results are as follows:—Acoustics, Light and Heat: Nine first-class, thirteen second-class.—Theoretical Mechanics: Three first-class, thirteen second-class.—Physical Geography: Twelve first-class, twenty-two second-class.—Steam and the Steam Engine: Three first-class, twenty-five second-class.—Applied Mechanics: Four first-class, twenty-five second-class.—Building Construction: Two first-class, eight second-class.—Animal Physiology:—Two first-class, thirty-one second-class.—Machine Drawing: Nine first-class, twenty-three second-class.—Inorganic Chemistry: Eight first-class, fifteen second-class. (Six second-class by students from Cullingworth.)—Laboratory Practice: Six first-class, four second-class.—Mathematics: Three first-class, twelve second-class. In all, sixty-one first-class passes, and one hundred and ninety-one second-class passes. The Keighley School of Art is attended by about one hundred young men of the town. The examiners at South Kensington have passed the drawings of eighteen of them in the elementary section, and of five in the advanced section, while the works of three—Annie Preston, Thomas Ramsden, and J. Midgley—have been laid out for national competition.

THE fruit crop of 1872 (says the *Gardeners' Magazine*) s probably the smallest that the most experienced and observant cultivator can call to remembrance. It is certainly but little better than no crop at all, and in many fruit-growing districts will not pay for gathering, and, therefore, perhaps, will be lost entirely. The imports of fruit from the Continent have been very much below the average hitherto this year; and the fact suggests itself that our neighbours across the Channel are in much the same plight as ourselves as respects this season's product of fruit. Usually in seasons notable for short supplies of fruit, some kinds are sufficiently plentiful to compensate in part for the general deficiency, but the present is an exceptional season in that respect, for the failure is complete. There can be no mystery about the cause of this general barrenness. The trees made a good growth last year, and the wood was sufficiently ripened. Hence there was a good show of bloom when vegetation was roused into activity by the genial weather which occurred in the month of February. The crop was ruined by the second winter that distinguished the month of March and greater part of the month of April.

IT is estimated that the whole available stock of the famous "Torbane Hill mineral" does not now exceed 50,000 tons, for the extraction of which a pit is about to be sunk. A trustworthy authority states the quantity already worked at about 1,800,000 tons.

IN a communication from Natal, Mr. G. R. Blanche states that Mr. B. Bouwer had seen, in a stone cave in Namaqua-land, about twelve days from Lake Ngami, pictures of all sorts of animals, drawn by Bushmen, in which the unicorn was distinctly delineated. Mr. Bouwer added that an old Bushman at Ghanze told him that he had many years ago seen the animal, that it was very fierce, but that it had now gone away. He had heard, besides, other Bushmen speak in similar terms, of the reputed fabulous beast. Mr. Blanche concludes:—"My opinion is, that the unicorn existed recently in Africa, and that it is *not proved* to be extinct now, but that the probability of its being in existence now is not very great." He rests this conclusion on the general accuracy of such rude sketches by savages in other parts of the world besides Africa, asking, if the unicorn never did exist, why should drawings of it be made in Namaqua-land, Natal, the Transvaal Republic and Cape Colony, possessing the same general and one particular characteristic.

FRANK CLOWES, Esq., B.Sc., London, F.C.S., has been appointed Science Master at Queenwood College, Hants.

THE *American Naturalist* for July contains a pretty exhaustive account of the Wyandotte Cave and its fauna, by Prof. E. D. Cope. The animals catalogued are fifteen in number, but as this collection was the result of only two days' exploration, Prof. Cope considers that the Wyandotte is richer in life than the better known Mammoth Cave, which has yielded only seventeen species after frequent examination. He describes a curious parasite—a Lernæan—on the blind fish of the cave. The representatives in the Wyandotte of two of the blind genera in the Mammoth Cave are furnished with eyes.

IN his paper on the Wyandotte Cave, in the July number of the *American Naturalist*, Prof. Cope incidentally remarks:—"I believe that wild animals betake themselves to caves to die, and that this habit accounts in large part for the great collections of skeletons found in the cave deposits of the world. After much experience in woodcraft, I may say that I never found the bones of a wild animal which had not died by the hand of man lying exposed in the forest."

THE small white butterfly (*Pieris rapæ*) which has quite recently become naturalised in North America, is likely to spread over the more temperate parts of that continent, to the serious detriment of farmers and gardeners. In a paper on the subject in the *Canadian Entomologist*, Mr. G. J. Bowles, of Montreal, states that the insect has already spread over the province of Quebec and the New England States, and is estimated to have destroyed 500,000 dols. worth of cabbages last year in the vicinity of New York alone. Mr. Bowles communicates some interesting facts in the life history of the immigrant butterfly. "The species," he says, "in its new habitat, has to pass through extremes of temperature to which it has not been accustomed in England, from which country it was most probably introduced; and while the increased summer heat of Canada appears to have made it more prolific, by augmenting the number of broods, the greater cold of winter has balanced the account by killing off, while in the chrysalis state, the surplus which otherwise would have rendered the insect an intolerable pest. The 'compensating' principle in the laws of nature," he adds, "is thus in useful operation with regard to *P. rapæ*; and as the power of cold decreases in effectiveness through the butterfly becoming acclimatised (which will probably happen in course of time), no doubt other agencies will arise, in the shape of new parasitic enemies, to keep the species within due bounds."

MR. H. HAUPT, C.E., in an article in *Van Nostrand's Engineering Magazine* (N.Y.), proposes a system of narrow gauge wooden railways in rural districts and sparsely-settled localities in America, which he describes at some length, and asserts can be constructed more cheaply than ordinary country roads, and upon which transportation can be conducted at less expense than on ordinary railroads. The system, he adds, has been tested to a limited extent, and found to answer admirably.

A SUPPLEMENT to the fifth annual report of the United States' Geological Survey has just been published. It consists of an enumeration, with descriptions by M. Lesquereux, of tertiary fossil plants collected by Dr. F. V. Hayden in 1870, from which some important climatic and other conclusions are drawn.

IT is stated that a plan has been submitted to the Spanish Government for a tunnel under the Straits of Gibraltar, which might be connected with the shortest route to India. The length to be traversed would be 13,800 metres, while that of the contemplated Dover and Calais tunnel is stated as 32,000.

THE late thunderstorms have done considerable damage to the Postal Telegraphs of the United Kingdom. Demagnetisation of needles, and in a large number of instances the fusing and complete destructions of the instrument coils, show that the want of an efficient lightning protector is still much felt.

CORK trees are being extensively introduced into Southern California.

FORMS OF SOLAR PROTUBERANCES *

PROFESSOR TACCHINI gave a full account of some of the work recently done by the Italian Society of Spectroscopists, which will be read with interest. At the beginning of his discourse he dealt specially with the observations on the solar protuberances, made with the view of throwing light on the question, whether the strata below the sun's chromosphere are solid, liquid, or gaseous. If we suppose that the protuberances have the form of jets, that is to say, narrow at the base and spreading out like a fan, as in the jets of gas which issue from terrestrial volcanoes, and if, moreover, instead of being composed of one element or a small number of elements, they are composed, from base to summit, of numerous materials, then it will appear probable that they are produced by eruptions taking place through a strongly resisting medium; and consequently that there must be already formed, on the surface of the sun, a crust solid enough to resist, for the most part, the powerful tension of the internal incandescent gases, which, breaking through this crust at certain points, give rise to violent eruptions, constituting the phenomenon of the solar protuberances. On the other hand, if all or most of the protuberances have a wide base and taper upwards like a pyramid, if their composition is simple, perhaps of the same materials as the chromosphere—a complex composition occurring only in a few of them, and at the base or at a small height above it—then the protuberances, properly so called, must be regarded, not as true eruptions, but as alterations of the chromosphere in those parts, where, through special circumstances, the composition of the subjacent strata becomes modified, either by an outflow of the internal constituents of the solar sphere—in which case the phenomenon is brought about by internal causes—or by disturbances arising in particular zones in consequence of movements developed in the sun's atmosphere, in which case the protuberances are produced by external causes; in other cases both these causes may concur in the production of the phenomena in question.

These considerations are sufficient to show the great importance of establishing the general character of the solar protuberances, and for this purpose, and to avoid certain sources of error, Prof. Tacchini invited P. Secchi, at Rome, and Prof. Lorenzoni, at Padua, to join with him in making contemporaneous observations of the solar protuberances. The proposal was favourably received, and it was agreed that from the 1st to the 13th of July, 1871, observations of the entire limb of the sun should be made from 7 to 10 o'clock.

The spectroscope employed by Tacchini at Palermo is formed of three direct vision prisms, constructed by Tauber, of Leipzig; that of P. Secchi is an instrument with angular vision, somewhat inferior in power to the Palermo instrument; and that of Prof. Lorenzoni is a direct-vision spectroscope which was used in Sicily in the observation of the total eclipse of 1870.

A comparison of the observations made at Rome and at Palermo led to the following results:—

1. All the masses are found indiscriminately in the drawings made at Rome and at Palermo; the most remarkable peculiarities of the chromosphere are likewise reproduced in both.

2. The principal characters of the forms of the protuberances are identical in the two sets of drawings; the direction and position of the plumes, the luminous masses, and frequently the regions of the chromosphere where the flames have a peculiar appearance, are perfectly identical.

3. The heights of the protuberances are for the most part the same, notwithstanding the diversity of the methods employed for measuring them.

4. The differences in the two sets of delineations are of two kinds: the first arising from the mode of drawing, the second from the greater distinctness of vision at Palermo. Other differences are real, being due to the rapid changes taking place in the protuberances.

At Padua the observations were limited to the delineation of individual protuberances; these were found to be the same in form and altitude as those seen at Rome and Palermo, thus affording proof that at the three stations, with different means of observation, the objects seen were identical, and removing any doubt that might previously have existed as to the power of the spectroscope to afford accurate results respecting the chromosphere and the forms of the protuberances.

Tacchini next proceeded to consider the general form of the protuberances. By observations with the spectroscope, continued from March 1871 to February 1872, he found that out of 2,903 protuberances, only 234, or abour 8 per cent., have the form of a tree or of a fan, that is to say, are narrow at the base and spread out towards the upper part, as if they were produced by volcanic eruptions, whereas the remaining 92 per cent. have a broad base and taper upwards like a pyramid, seem, therefore, to be due rather to a simple throwing up of the substance of the chromosphere. He, therefore, regards the general form of the protuberances as inconsistent with the existence of a solid crust on the surface of the sun. This is entirely in accordance with the English work.

When the chromosphere is observed with large instruments—and under peculiarly favourable conditions—it does not present the appearance of a continuous level stratum, as should be the case if it were solid, pasty, or liquid, but often appears to be formed of a continuous series of very distinct flames.* It looks indeed like a general conflagration, more or less developed, which is incessantly renewed with greater or less force, and with especial violence in particular parts, where it gives rise to the protuberances. In small instruments, on the contrary, the chromosphere appears smooth, excepting certain parts where the flames rise to an unusual height. In like manner the details of the protuberances, and especially their outlines, as observed with small instruments, are not comparable with those made with large telescopes, which must necessarily afford a higher degree of definition.

Tacchini next described certain observations which tend to show that the so-called jets, projected upwards from the chromosphere, have their counterpart in a descent of matter from above, in a kind of solar rain, when a mass or cloud of luminous hydrogen suspended in the sun's atmosphere throws off filaments on both sides, which gradually descend and unite at the sun's edge, thereby forming a protuberance which exhibits the arborescent or fan-like form usually attributed to an eruptive jet. This is a new point of great interest.

The theory which attributes the solar protuberances to violent eruptions forcing their way through a solid crust, or a liquid of great resisting power, may, Tacchini remarks, appear to derive some support from the chemical composition of the protuberances. If the masses which project above the chromosphere were found to contain many materials different from those which compose the chromosphere itself, there would be good reason for regarding them as projected from the interior of the sun. And, in fact, some of the protuberances have a somewhat complex chemical composition, the bright lines observed in their spectra often corresponding to magnesium, iron, sodium, titanium, calcium, barium, nickel, chromium, copper, together with eight other lines which may belong to as many different substances; in all therefore eighteen elements, besides hydrogen and the element provisionally named Helium, which is never absent, and represents the constant material of the entire chromosphere. On August 27 last in a single protuberance nine different substances, represented by a brilliant spectrum of twenty-four bright lines, nine of which belonged to iron were seen.

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* "On the Forms of the Solar Protuberances and the Regions of Magnesium and Iron on the Surface of the Sun." By P. Tacchini (Public Conference held on Feb. 18, 1872, in the Royal University of Palermo).

* See Lockyer, Proc. R.S. vol. xvii. 1870, p. 354.